

WHAT IS CLAIMED IS:

1. A method for adapting a digital subscriber line (DSL) communications duplexing ratio to meet user application needs, comprising the steps of:

5 determining, for a new DSL loop communication, a required upstream bit rate and a required downstream bit rate for the user application;

dividing the required upstream bit rate by the required downstream bit rate to obtain a desired duplexing ratio for the new DSL communication; and

10 adapting a duplexing ratio implemented by a DSL modem in support of the new DSL loop communication to at least approximate the desired duplexing ratio.

2. The method as in claim 1 wherein the step of adapting the duplexing ratio comprises the step of adjusting analog filters to alter an upstream and downstream bandwidth used by the modem for the new DSL loop
5 communication.

3. The method as in claim 1 wherein the step of
adapting the duplexing ratio comprises the step of
adjusting digital filters to alter an upstream and
downstream bandwidth used by the modem for the new DSL loop
5 communication.

4. The method as in claim 1 wherein the step of
determining further comprises the step of removing
unnecessary idle ATM cells, and the required
upstream/downstream bit rate for the new DSL loop
5 communication is a bit rate needed for the new DSL loop
communication without inclusion of unnecessary idle ATM
cells.

5. The method as in claim 1 wherein the implemented
duplexing ratio defines a total available upstream
bandwidth and a total available downstream bandwidth for
the new DSL loop communication on a certain DSL loop.

6. The method as in claim 5 wherein the required upstream bit rate of the new DSL loop communication corresponds to a required upstream bandwidth that is smaller than the total available upstream bandwidth, the
5 method further comprising the steps of:

calculating, for a plurality of location positions of the required upstream bandwidth for the new DSL loop communication within the corresponding total available upstream bandwidth, a crosstalk noise effect with respect
10 to other active DSL loops in a same cable bundle; and

choosing a location position for the required upstream bandwidth to carry the new DSL loop communication within the total available upstream bandwidth where the calculated crosstalk noise effect with respect to any other active DSL
15 loops is minimized.

7. The method as in claim 5 wherein the required downstream bit rate of the new DSL loop communication corresponds to a required downstream bandwidth that is smaller than the total available downstream bandwidth, the
5 method further comprising the steps of:

calculating, for a plurality of location positions of the required downstream bandwidth for the new DSL loop communication within the corresponding total available downstream bandwidth, a crosstalk noise effect with respect
10 to other active DSL loops in a same cable bundle; and

choosing a location position for the required downstream bandwidth to carry the new DSL loop communication within the total available downstream bandwidth where the calculated crosstalk noise effect with
15 respect to any other active DSL loops is minimized.

8. The method as in claim 5 further comprising execution of the steps of both claims 6 and 7 to minimize both upstream and downstream crosstalk noise.

9. The method as in claim 8 wherein the steps of calculating further include the step of sliding the required upstream/downstream bandwidth across the total available upstream/downstream bandwidth at the plurality
5 of location positions for which crosstalk noise effect is calculated.

10. The method as in claim 8 wherein the crosstalk noise effect is near-end crosstalk (NEXT) noise effect.

11. The method as in claim 8 wherein the calculated crosstalk noise effect is an estimation calculated effect.

12. The method as in claim 8 wherein the calculated crosstalk noise effect is an analytically calculated effect.

13. The method as in claim 1 wherein the DSL modem is selectively configurable to implement any one of a plurality of discrete duplexing ratios, the step of adapting further comprising the step of selecting a certain

5 one of the discrete duplexing ratios that most closely
meets the desired duplexing ratio.

14. The method as in claim 1 further including the
steps of:

monitoring noise on subcarriers used to implement the
duplexing ratio for the new DSL loop communication;

5 testing if the monitored noise exceeds a threshold on
any of the subcarriers; and

if so, abandoning the subcarrier.

15. The method as in claim 1 further including the
step of cancelling echoes when upstream and downstream are
overlapped in the adapted duplexing ratio.

16. Apparatus for adapting a digital subscriber line (DSL) communications duplexing ratio to meet user application needs, comprising:

means for determining, for a new DSL loop communication, a required upstream bit rate and a required downstream bit rate for the user application, the required upstream bit rate being divided by the required downstream bit rate to obtain a desired duplexing ratio for the new DSL communication; and

means for adapting a duplexing ratio implemented by a DSL modem in support of the new DSL loop communication to at least approximate the desired duplexing ratio.

17. The apparatus as in claim 16 wherein the means for adapting the duplexing ratio operates to alter an upstream and downstream bandwidth used by the modem for the new DSL loop communication.

18. The apparatus as in claim 16 wherein the means for adapting the duplexing ratio is operable to alter an upstream and downstream bandwidth used by the modem for the new DSL loop communication.

19. The apparatus as in claim 16 wherein the means for determining operates to remove unnecessary idle ATM cells, and the required upstream/downstream bit rate for the new DSL loop communication is a bit rate needed for the
5 new DSL loop communication without inclusion of unnecessary idle ATM cells.

20. The apparatus as in claim 16 wherein the implemented duplexing ratio defines a total available upstream bandwidth and a total available downstream bandwidth for the new DSL loop communication on a certain
5 DSL loop.

21. The apparatus as in claim 20 wherein the required
upstream bit rate of the new DSL loop communication
corresponds to a required upstream bandwidth that is
smaller than the total available upstream bandwidth, the
5 apparatus further comprising:

means for calculating, for a plurality of location
positions of the required upstream bandwidth for the new
DSL loop communication within the corresponding total
available upstream bandwidth, a crosstalk noise effect with
10 respect to other active DSL loops in a same cable bundle;
and

means for choosing a location position for the
required upstream bandwidth to carry the new DSL loop
communication within the total available upstream bandwidth
15 where the calculated crosstalk noise effect with respect
to any other active DSL loops is minimized.

22. The apparatus as in claim 20 wherein the required downstream bit rate of the new DSL loop communication corresponds to a required downstream bandwidth that is smaller than the total available downstream bandwidth, the
5 apparatus further comprising:

means for calculating, for a plurality of location positions of the required downstream bandwidth for the new DSL loop communication within the corresponding total available downstream bandwidth, a crosstalk noise effect
10 with respect to other active DSL loops in a same cable bundle; and

means for choosing a location position for the required downstream bandwidth to carry the new DSL loop communication within the total available downstream
15 bandwidth where the calculated crosstalk noise effect with respect to any other active DSL loops is minimized.

23. The apparatus as in claim 20 further comprising the recited means of both claims 21 and 22 operable to minimize both upstream and downstream crosstalk noise.

24. The apparatus as in claim 23 wherein the means
for calculating operates to slide the required
upstream/downstream bandwidth across the total available
upstream/downstream bandwidth at the plurality of location
5 positions for which crosstalk noise effect is calculated.

25. The apparatus as in claim 23 wherein the
crosstalk noise effect is near-end crosstalk (NEXT) noise
effect.

26. The apparatus as in claim 22 wherein the
calculated crosstalk noise effect is an estimation
calculated effect.

27. The apparatus as in claim 23 wherein the
calculated crosstalk noise effect is an analytically
calculated effect.

28. The apparatus as in claim 16 wherein the DSL
modem is selectively configurable to implement any one of
a plurality of discrete duplexing ratios, the means for
adapting further operates to select a certain one of the

5 discrete duplexing ratios that most closely meets the
desired duplexing ratio.

29. The apparatus as in claim 16 further including:
means for monitoring noise on subcarriers used to
implement the duplexing ratio for the new DSL loop
communication;

5 means for testing if the monitored noise exceeds a
threshold on any of the subcarriers; and

means responsive thereto for abandoning the
subcarrier.

30. The apparatus as in claim 16 further including
an echo canceler operable to cancel echoes when upstream
and downstream are overlapped in the adapted duplexing
ratio.

31. A digital subscriber line (DSL) transceiver
connected to a certain loop in a cable bundle, comprising:

an idle cell removal machine that is operable to
determine for a new DSL loop communication on the certain
5 loop a required upstream bit rate and a required downstream
bit rate for a user application, the required upstream bit
rate being divided by the required downstream bit rate to
obtain a desired duplexing ratio for the new DSL
communication;

10 a duplexing controller operable to adapt a duplexing
ratio implemented in support of the new DSL loop
communication to at least approximate the desired duplexing
ratio.

32. The transceiver as in claim 31 wherein the
duplexing controller implements any one of a plurality of
discrete duplexing ratios, the duplexing controller being
further operable to select a certain one of the discrete
5 duplexing ratios that most closely meets the desired
duplexing ratio.

33. The transceiver as in claim 31 further including analog filters that are adjustable to alter an upstream and downstream bandwidth used for the new DSL loop communication.

34. The transceiver as in claim 31 further including digital filters that are adjustable to alter an upstream and downstream bandwidth used by the modem for the new DSL loop communication.

35. The transceiver as in claim 31 wherein the idle cell removal machine further operates to remove unnecessary idle ATM cells, and the required upstream/downstream bit rate for the new DSL loop communication is a bit rate
5 needed for data communication over the certain loop without inclusion of unnecessary idle ATM cells.

36. The transceiver as in claim 31 wherein the implemented duplexing ratio defines a total available upstream bandwidth and a total available downstream bandwidth for the new DSL loop communication on a certain
5 DSL loop.

37. The transceiver as in claim 36 wherein the required upstream bit rate of the new DSL loop communication corresponds to a required upstream bandwidth that is smaller than the total available upstream
5 bandwidth, the transceiver further comprising:

a bandwidth control algorithm for calculating, for a plurality of location positions of the required upstream bandwidth for the new DSL loop communication within the corresponding total available upstream bandwidth, a
10 crosstalk noise effect with respect to other active DSL loops in a same cable bundle; and

a noise minimization algorithm for choosing a location position for the required upstream bandwidth to carry the new DSL loop communication within the total available
15 upstream bandwidth where the calculated crosstalk noise effect with respect to any other active DSL loops is minimized.

38. The transceiver as in claim 36 wherein the required downstream bit rate of the new DSL loop communication corresponds to a required downstream bandwidth that is smaller than the total available downstream bandwidth, the transceiver further comprising:

a bandwidth control algorithm for calculating, for a plurality of location positions of the required downstream bandwidth for the new DSL loop communication within the corresponding total available downstream bandwidth, a crosstalk noise effect with respect to other active DSL loops in a same cable bundle; and

a noise minimization algorithm for choosing a location position for the required downstream bandwidth to carry the new DSL loop communication within the total available downstream bandwidth where the calculated crosstalk noise effect with respect to any other active DSL loops is minimized.

39. The transceiver as in claim 36 further operable to minimize both upstream and downstream crosstalk noise.

40. The transceiver as in claim 39 wherein the noise minimization algorithm operates to slide the required upstream/downstream bandwidth across the total available upstream/downstream bandwidth at the plurality of location
5 positions for which crosstalk noise effect is calculated.

41. The transceiver as in claim 39 wherein the crosstalk noise effect is near-end crosstalk (NEXT) noise effect.

42. The transceiver as in claim 39 wherein the calculated crosstalk noise effect is an estimation calculated effect.

43. The transceiver as in claim 39 wherein the calculated crosstalk noise effect is an analytically calculated effect.

44. The transceiver as in claim 31 further including
a bandwidth manager operable to monitor noise on
subcarriers used to implement the duplexing ratio for the
new DSL loop communication, test if the monitored noise
5 exceeds a threshold on any of the subcarriers, and abandon
the subcarrier if the noise exceeds the threshold.

45. The transceiver as in claim 31 further including
an echo canceler operable to cancel echoes when upstream
and downstream are overlapped in the adapted duplexing
ratio.

46. The transceiver as in claim 45 wherein the echo
canceler is designed to operate at a maximum overlapping
bandwidth between the upstream and the downstream.